

A left femoral artery to right femoral vein bypass graft for hemodialysis access

A case report

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Abstract

Rationale: As survival prospects improve for long-term patients with hemodialysis, it is common for patients to exhaust all upper extremity access options before other avenues need exploration. The purpose of this case report was to describe our experience in creating a prosthetic graft between left femoral artery and right femoral vein in a patient with history of central venous occlusion and bilateral femoral neck fracture.

Patient concerns: A female patient with hemodialysis exhausted all upper extremity access options along with bilateral femoral neck fracture.

Diagnoses: Patients with end-stage renal disease exhausted all upper extremity access options.

Interventions: We performed a left femoral artery to right femoral vein dialysis access utilizing a prosthetic graft and autologous cephalic vein.

Outcome: The graft was used for hemodialysis 3 weeks after the operation. There was no edema of the lower extremity through the immediate postoperative period as well as at follow up. The patient has been using the access for 9 months with no complication of thrombosis, infection, or bleeding.

Lessons: Prosthetic graft between the left femoral artery and right femoral vein is a simple, safe and novel approach to creating lower extremity access. This method could be a viable means of hemodialysis access in selected patients.

Abbreviations: AVF = autologous arteriovenous fistula, AVG = arteriovenous graft.

Keywords: AVF, hemodialysis access, prosthetic arteriovenous loop

1. Introduction

The demand for complex lower limb access surgery is increasing rapidly as the population requiring dialysis grows. When patients

with hemodialysis have exhausted all the upper extremity vascular access sites, a reliable vascular access in the lower limb could be a viable option for hemodialysis. Several complex vascular access procedures have already been described, including axillary loop, contralateral internal jugular vein bypass, superficial femoral vein transposition and femoral artery to right atrium bypass.^[1] Arterioarterial prosthetic loops as a hemodialysis access have also been reported.^[2]

Although many complex access procedures have been described previously, a prosthetic graft between the left femoral artery and right femoral vein has seldom been reported. Thus, our aim was to present our primary experience in creating a left femoral artery to right femoral vein arteriovenous bypass graft in a patient who developed central venous occlusion and bilateral femoral neck fracture.

2. Case presentation

A 36-year-old female patient with end-stage renal disease due to chronic nephritic syndrome had been treated with various dialysis accesses for over 8 years. She complained of dyspnea and had a thrombosed autogenous radial artery- cephalic fistula for 1 day. Significant medical history included failed tunneled cuffed hemodialysis catheter in both internal jugular vein and dialysis grafts in both upper extremities over 8 years, along with severe secondary hyperparathyroidism leading to bilateral femoral neck fracture and lack of movement of the lower extremities for 6 months. On physical examination, swelling of the face and lower extremities, along with tenderness and limited motion of both hip

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joints, No other significant findings were detected. The results of laboratory tests as following: parathyroid hormone 1396.8pg/mL, albumin 37.8g/L, serum creatinine 1125umol/L, and hemoglobin 109g/L. Liver function and coagulation function were within the normal range. A Doppler cardiac ultrasound revealed total cardiac enlargement with decreased left ventricular contractile function. A radiograph of the pelvis found bilateral femoral neck fracture.

Jugular vein venograms demonstrated superior vena cava occlusion, is not treatable using a smart stent. Upper extremity venograms demonstrated occlusion of the left internal jugular, and right cephalic vein. Placement of a left femoral vein catheter established temporary hemodialysis access. Due to bilateral upper extremities failed to find an adequate outflow vein and the patient's history of central venous occlusion, we decided to perform a left femoral artery to right femoral vein dialysis access utilizing a prosthetic graft and autologous cephalic vein.

The patient was placed in the supine position. Using a longitudinal incision on the right arm, the thrombosed cephalic vein was harvested. The thrombosed cephalic vein was cut open and its inner hyperplasia was removed. We reconstructed the cephalic vein preparing for anastomosis with the left femoral artery and prosthetic graft. The left femoral artery and right femoral vein on both sides were dissected through small groin incisions. Then, the left femoral artery and right femoral vein

were exposed. The graft was then tunneled through the hypogastric region below the umbilicus. An end-to-side anastomosis was performed between the left femoral artery and reconstructed cephalic vein. Then, end-to-end anastomosis was performed between the reconstructed cephalic vein and prosthetic graft (Figs. 1 and 2). The bottom anastomosis was carried out with the same suture, end-to-side with the common femoral vein. Ultimately, a drainage tube was placed and all the wounds closed in layers. The patient experienced bleeding (750 mL) and received an autologous blood transfusion (600 mL).

Post-operatively, the patient received aspirin 100 mg daily. The graft was used for hemodialysis 3 weeks after the operation. There was no edema of the lower extremity through the immediate postoperative period as well as at follow up. On follow up, the patient has been using the access for 9 months with no complication of thrombosis, infection, or bleeding.

3. Discussion

Bilateral upper limb central vein occlusions are seen in an increasing number of patients with hemodialysis. Moreover, all upper limb access options are also seen to be exhausted in numerous patients, causing a rapid increase in the demand for lower limb vascular access. The KDOQI and European best practice guidelines suggested that lower limb access is only

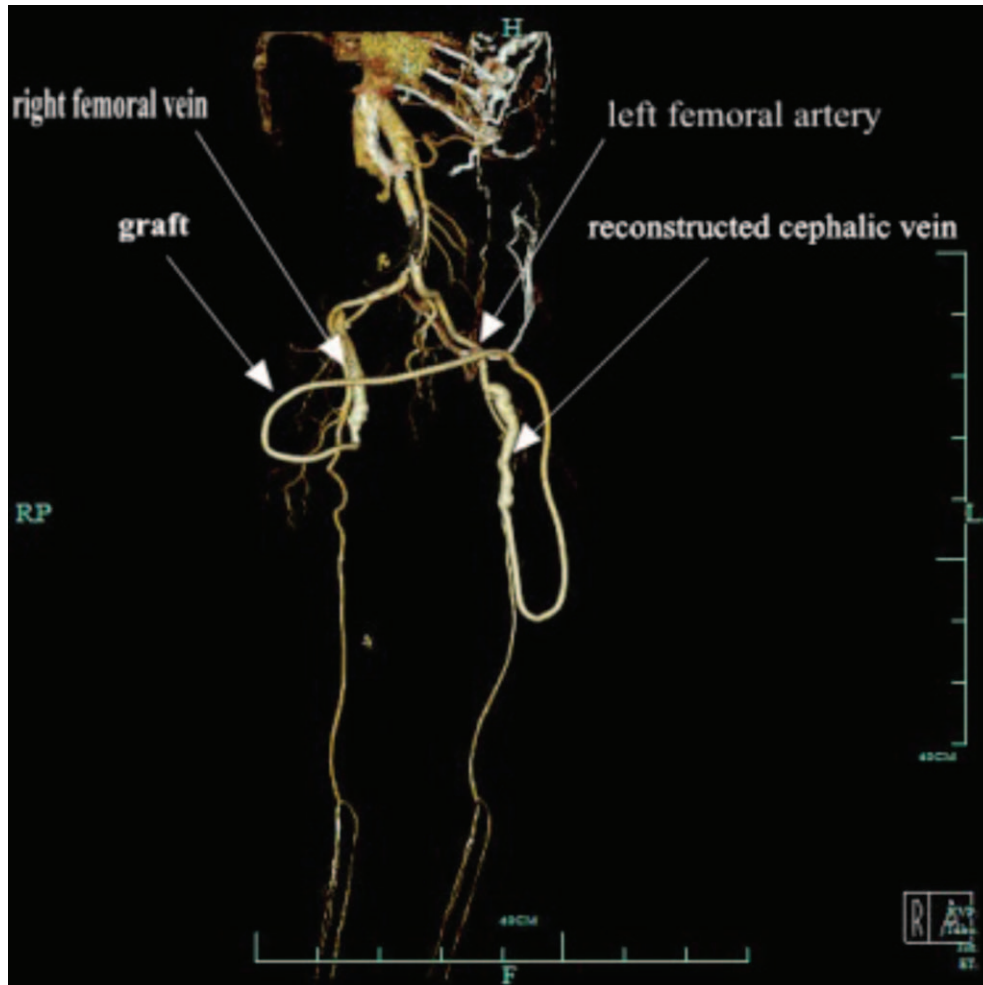


Figure 1. Postoperative computed tomography angiography (CTA) of prosthetic graft between left femoral artery to right femoral vein.

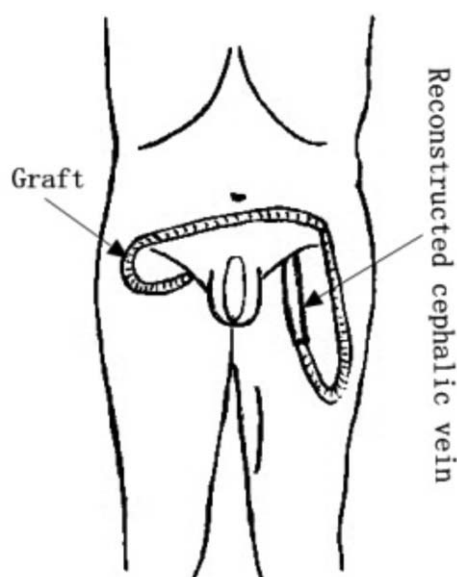


Figure 2. Illustration of left femoral artery to right femoral vein loop graft.

indicated for the patients in whom all upper limb access possibilities are exhausted.^[3] Central venous occlusion or stenosis frequently leads to the lower limb vascular access being availed. In the present case, the patients presented with central venous occlusion from placement of multiple central venous hemodialysis catheters. Our patient had also developed bilateral femoral neck fracture due to severe secondary hyperparathyroidism. As there was no upper limb access option, we successfully created a prosthetic graft between the left femoral artery and right femoral vein. To enable future revision surgery, we also used the autologous cephalic vein to create an anastomosis with the left femoral artery and prosthetic graft. To our knowledge, this kind of complicated dialysis access is rarely reported.

Lower limb vascular access can be divided into autologous arteriovenous fistula (AVF) or arteriovenous graft (AVG). The greater saphenous vein is commonly used to create lower limb AVF. May et al^[4] 1st described creating an autologous AVF using the greater saphenous vein. However, most studies on this were small case series. Wilmlink stated that^[5] the results of lower limb saphenous vein fistulae were disappointing and should only be used in special cases. Transposed femoral vein fistulas were also reported with better primary and secondary patency rates than the HeRO device for hemodialysis.^[6] The superficial femoral vein has been reported as a source of hemodialysis access, but with numerous complications, including wound complications, hematoma, pulmonary embolism, poor patency rates, and anastomotic breakdown.^[7] Keeping all this in mind, in our case, we did not consider lower limb saphenous vein fistulae or transposed femoral vein fistulas as the lower limb AVF needs a long maturing time. We selected the prosthetic graft between the left femoral artery and right femoral vein for its shorter maturation period; the patient urgently needed a permanent hemodialysis access.

Thigh AVG is a common form of lower limb access. Parekh et al^[8] classified the synthetic lower extremity AVG into upper thigh and midthigh synthetic graft. A retrospective study^[9] showed that femoral PTFE grafts had no long-term complications and the main cause for graft loss were graft thrombosis,

bacteremia, worsening claudication and death. Antoniou et al^[10] reported that thigh AVG had acceptable patency rates, but autologous femoral vein AVF had better patency rates. Chemla et al^[11] described a femorofemoral crossover bypass similar to that used in our case. This graft had excellent patency, but in our case, we reconstructed the thrombosed cephalic vein for convenience during potential future surgery. At present, in our case, the synthetic AVG was used for 9 months without complications. To our knowledge, this bypass is a novel method for creating hemodialysis access.

Although we reported a successful left femoral artery to right femoral vein prosthetic graft for hemodialysis access, we must remember that lower extremity AVF is preferred over arteriovenous synthetic graft. Ischemia, infection, thrombosis, and bleeding are also complications of prosthetic graft left between femoral artery and right femoral vein. We did not encounter these complications in our case as our follow-up period was only 9 months.

4. Conclusion

We have demonstrated 9 months primary patency of a prosthetic graft between the left femoral artery and right femoral vein. This could be a viable hemodialysis access method in selected patients. However, it is important to remember that an AVF on the upper or lower extremity is still superior to a lower extremity AVG because of its better long-term patency and lower complications rate. Each patient should be evaluated individually before potentially opting for AVG.

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Author contributions

W-J, S-J and L-J contributed to the conception and design of the study. W-L conducted the work and collected the data. W-L, X-J, X-J drafted the manuscript. All authors approved the final version to be published.

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